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Commentary: Continuum of reproductive casualty – or causality?

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1366 words

The origins of the phrase

Abraham Lilienfeld was a distinguished epidemiologist with many research interests. In the early 1950's he had joined forces with the psychiatrist Benjamin Pasamanick, in studying a number of childhood conditions including epilepsy, speech disorders, cerebral palsy and 'mental deficiency' (now more appropriately known as 'intellectual disability'. They used case-control strategies, and compared the frequencies of preterm delivery, obstetric and neonatal complications.[1-4] An academic public health nurse, Martha Rogers (who had been persuaded not to study medicine as it was 'not a suitable job for a woman') joined in a study of childhood behaviour disorders;[5,6] she may have been key in thinking through the argument presented in this paper.[7] The authors were struck by the common factors that were highlighted by their research in all except the cases of speech disorder.[8] They stated that the obstetric and neonatal complications highlighted intrauterine anoxia rather than a mechanical consequence of the type of delivery. This led them to point out that similar complications were associated with increased risk of stillbirth and neonatal death, and this led them to suggest a 'continuum of reproductive casualty'. They argued that the strengths of the associations were greatest for perinatal deaths, somewhat lower for cerebral palsy and then reduced further for epilepsy, intellectual disability and behaviour disorders. They suggested that the severity of each disorder indicated the degree of brain damage that had occurred, and named the sequence the Continuum of Reproductive Casualty.[7]

A similar broad brush approach to obstetric and perinatal details was a study concerned with non-right handedness, which identified 'birth stress' as being on the causal pathway, and suggested that it was at the more benign end of the continuum of reproductive casualty.[9] These authors defined birth stress as any of the following: multiple birth, preterm delivery, prolonged labour,

breech delivery, Caesarean section, and neonatal conditions immediately after birth, and again assumed that the effect was likely due to cerebral anoxia. Like the Passamanick and Lilienfeld studies they used the word ‘casualty’ but the implication was of causation.

So too did Stott in 1958. However he had a much more focussed definition of exposure. He identified prenatal stress in terms of major life events occurring to the mother during pregnancy, and quoted the markedly increased risk of defects of the central nervous system in Germany after the famine at the end of the Second World War. He suggested that central nervous system malformations should be included at the severe end of the continuum of reproductive casualty and that stress in pregnancy might have prompted a causal sequence.[10] Unfortunately part of his argument arose from a study which included children with Down’s syndrome; in the year after his paper was published an extra chromosome was shown to be the cause of Down’s syndrome. His argument for a link between poor outcomes of pregnancy and prenatal stressors was dismissed, and with it any idea of such stress causing a continuum of reproductive casualty.

Later developments

There was little further discussion of the concept until Margaret Ounsted wrote a discussion piece in 1987 based on the findings of a longitudinal study in which she was involved; this was concerned with pregnancies of women who had hypertension in pregnancy.[11] The majority of these women had mild hypertension and their outcomes were similar to those of the rest of the local birth population. However there were two groups with severe pregnancy conditions – one (mainly with severe hypertension, but not pre-eclampsia) had a ten-fold increase in perinatal mortality, and much increased rates of preterm delivery, small-for-dates births, Caesarean deliveries and neonatal complications; on follow-up to the age of seven, there were no differences between this group and the group with mild hypertension on a variety of tests. Similarly, the group which had superimposed pre-eclampsia also had very high perinatal mortality, but the survivors actually had better

neurocognitive abilities at age seven than those whose mothers had very mild hypertension. This caused Dr Ounsted to cast doubt of the concept of the Continuum of Reproductive Casualty.[11]

Subsequently there has been some interest from psychiatrists in regard to the concept of the continuum, largely concentrating on the behaviour and IQ of children born of low birthweight, and showing an increase in prevalence of children with functional disabilities, especially learning difficulties [see review by Breslau[12]]. However the author did not indicate that she considered that the low birthweight caused the neurocognitive difficulties, but rather that both were on the same pathway or continuum. Again the word 'casualty' was used, implying someone badly affected by an event or situation.[13]

As far as I can tell, Michael Owen was the first to use the word 'causality' rather than 'casualty'. He expanded the original concept in an editorial entitled 'Intellectual disability and major psychiatric disorders: a continuum of neurodevelopmental causality' in which he suggested that the original concept of a continuum of reproductive causality (sic) should be extended to encompass a continuum of genetically and environmentally induced neurodevelopmental causality along which lie intellectual disability, epilepsy, autism, ADHD, schizophrenia and possibly the major affective disorders.[14]

Post script

Curiously in preparing for this Commentary I could find no mention in the recent epidemiological literature concerning either of these concepts. Possibly this is because of the words 'casualty' or 'causality' – words which makes traditionally trained epidemiologists go pale (or see red). This is strange since the aim of epidemiological studies includes identifying the cause and thence developing preventive strategies. Possibly casualty sounds too extreme, and causality too bold. Whichever is true, the concept that specific exposures can result in a variety of consequences is now well accepted, as is the concept of consequences of prenatal (or preconceptional) exposures depending on many factors including the genetics of parents and fetus, and a number of coinciding

environmental exposures. It is probably time for both phrases to be abandoned – and the importance of the epidemiological complexity of causal consequences recognised.

Conflict of interest: None declared

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